

LASER PROCESSINGBackground of the Invention

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SMH 5  
0525-09

This invention relates to employing a laser beam to vaporize or otherwise alter a portion of a circuit element on a silicon substrate and is particularly applicable to vaporizing metal, polysilicide and polysilicon links for memory repair.

10 Semiconductor devices such as memories typically have conductive links adhered to a transparent insulator layer such as silicon oxide, which is supported by the main silicon substrate. During laser processing of such semiconductor devices, while the beam is incident on the link or circuit element, some of the energy also reaches the substrate. Depending upon the power of the beam, length of time of application of the beam, and other operating parameters, the silicon substrate can be overheated and damaged.

20 Laser processes of this kind have typically been conducted at wavelengths of 1.047  $\mu\text{m}$  or 1.064  $\mu\text{m}$ . Silicon has sufficiently low absorption at these wavelengths that the amount of beam energy employed to evaporate typical polysilicide and polysilicon links has not harmed the underlying silicon substrate.

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30 It has been recognized, e.g., by the present inventor, by Lapham et al. in U.S. Patent No. 4,399,345, and by others, that in laser processing of semiconductor devices, it can be advantageous to use wavelengths beyond the "absorption edge" of silicon (i.e., wavelengths greater than about 1.1  $\mu\text{m}$ , where the absorption of silicon drops precipitously). This makes the silicon substrate more transparent to the laser beam, and reduces heating of the silicon caused by absorption of the beam. The preferred

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